# VICTORIA REGIA;

OR

## THE GREAT WATER LILY

OF

# AMERICA.

WITH A BRIEF ACCOUNT OF ITS

## DISCOVERY AND INTRODUCTION INTO CULTIVATION:

WITH ILLUSTRATIONS BY WILLIAM SHARP,

FROM SPECIMENS GROWN AT SALEM, MASSACHUSETTS, U. S. A.

BY JOHN FISK ALLEN.

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BOSTON:
PRINTED AND PUBLISHED FOR THE AUTHOR,
BY DUTTON AND WENTWORTH, 37 CONGRESS STREET.
1854.

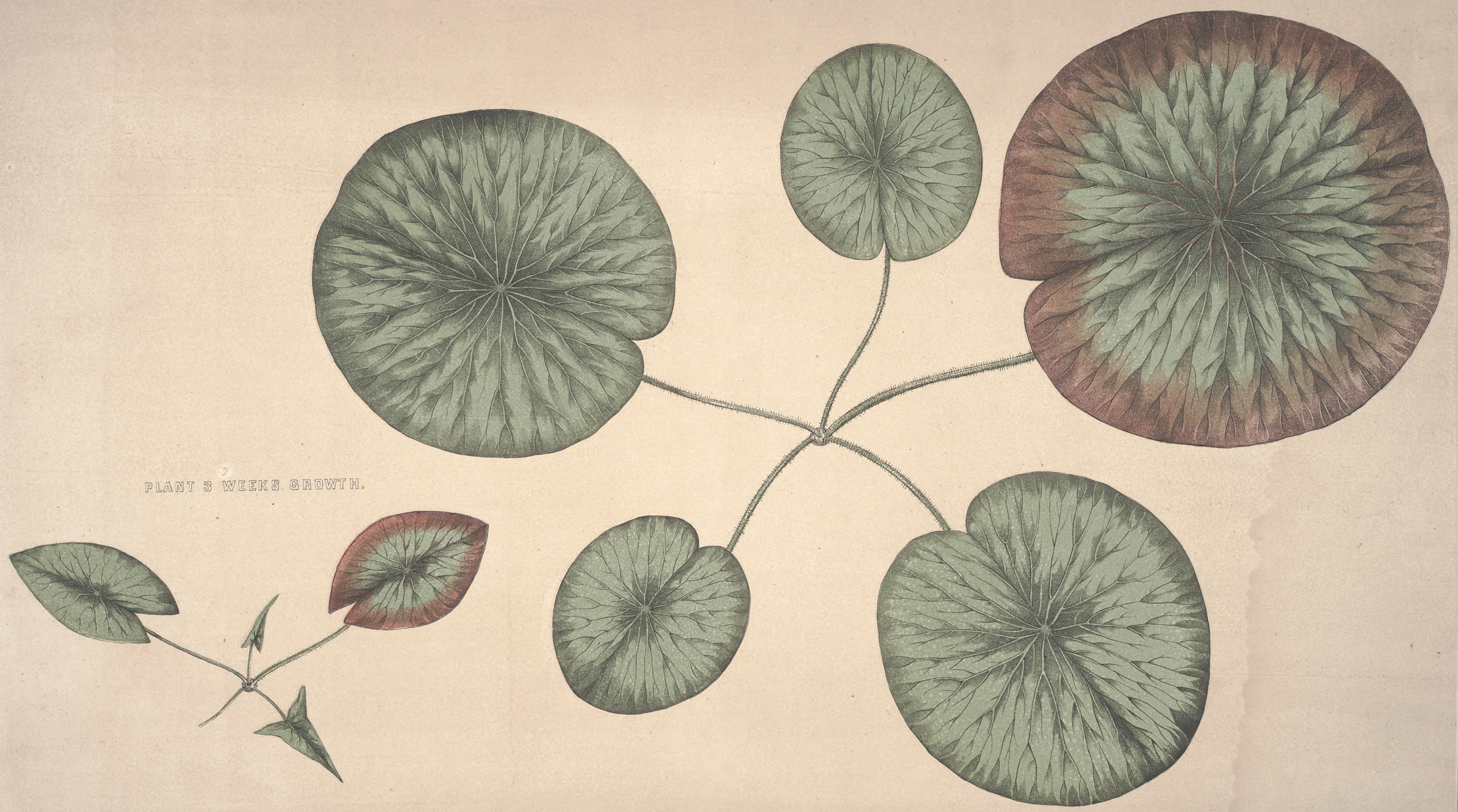
SOUTH.

EAST.

WEST.

PLANT 6 TO 7 WEEKS GROWTH.

PLANT 3 WEEKS GROWTH.



¼th the natural size.

NORTH.

From a sketch by John Fisk Allen.

Sharp & Son, Chromo lithrs Washington Village Dorchester, Mass.

Ea 88

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MISSOURI
BOTANICAL
GARDEN

TO

# CALEB COPE, ESQ.

EX-PRESIDENT OF THE PENNSYLVANIA HORTICULTURAL SOCIETY;

TO WHOSE ZEAL IN HORTICULTURE WE ARE INDEBTED FOR THE

INTRODUCTION TO THIS COUNTRY OF MANY RARE AND BEAUTIFUL PLANTS,

AND TO WHOM BELONGS THE HONOR OF FIRST CULTIVATING AND FLOWERING, IN THE UNITED STATES,

The Great American Water Lily,

THIS TREATISE IS RESPECTFULLY DEDICATED BY

THE AUTHOR.

# VICTORIA REGIA;

## THE AMERICAN WATER LILY.

## INTRODUCTION.

The great interest manifested by the public to know somewhat of this Lily has induced me to prepare this treatise. The Victoria Regia is found distributed north and south of the Amazon, in the bays and still waters of the river and its tributaries, in many of the lakes or ponds of Tropical America, the Berbice River, and various localities of that section of the continent.

A plant so remarkable, for the rapidity of its growth, the leaves often expanding eight inches in diameter daily; instances under my own observation having occurred wherein they have increased, between sunrise and sunset, half an inch hourly,—for the beauty and wonderful construction of these leaves,—for the ever-blooming property of the plant,—for the seeming identity, at the first, of each blossom, yet in reality varying so much as to require a constant vigilance to detect every distinct characteristic;—these and other considerations seemed to justify a careful and familiar description, accompanied by such appropriate illustrations as I have been able to procure.

## WHEN DISCOVERED.

This plant was discovered about fifty-one years ago, by the botanist Hænke, who was sent by the Spanish Government, in the year 1801, to investigate the vegetable productions of Peru, and the fruits of whose labors have been lost to science.

M. A. D'Orbigny says: "When I was travelling in Central America, in the country of the wild Guarayas, who are a tribe of Guaranis or Caribs, I made acquaintance with Father La Cueva, a Spanish missionary, a good and well-informed man, beloved for his patriarchal virtues, and who had long and earnestly devoted himself to the conversion of the natives. The traveller who, after spending a year among Indians, meets with a fellow-creature capable of understanding and exchanging sentiments with him, can easily appreciate the delight and eagerness with which I conversed with this venerable old man, thirty years of whose life had been passed among savages." In one of these interviews, he mentioned that, with Hænke, he was in a canoe on the Rio Mamore, one of the great tributaries of the River Amazon, when they discovered in the marshes, by the side of the stream, a flower so extraordinary that Hænke fell on his knees in a transport of admiration.

This fact was not made known till nearly forty years afterwards, and it is not a little remarkable that so strange a plant, now known to abound in the still, quiet nooks of most of the rivers in Tropical America, east of the Andes, should not have been noticed by ordinary travellers, in such a manner as to make it recognizable by the reader; and "yet it is without any exception, if we take it as a whole,—leaves, flowers, size, color, and graceful position in the water, especially when viewed with the usual accompaniments of Tropical American aquatic scenery,—the most beautiful plant known to Europeans."

M. Bonpland, the fellow-laborer of Humboldt, is the next who had the pleasure of beholding this plant. M. Bonpland says: "In the year 1820, I found near the town of Corrientes, and not far from the forks of the Parana and the River Paraguay, a magnificent aquatic plant, known to the natives by the name of Corn or Wheat of the Water." (*Mayz de l'Agua*, maize of the water, is so called because it bears fruit filled with seeds which is substituted for grains of maize, and the flour from which is of superior whiteness.) In 1835, he sent seeds to the Garden of Plants, at Paris. "In 1849, when at Rio Pardo," he further says, "I was surprised to see all the ladies equipped with fans, with correct miniature drawings of this Nymphæa, which I described twenty-nine years before." The farina made from the seed is preferred to that from the finest wheat, and the ladies of Corrientes, when the fruits are ripe, obtain the seeds and extract the flour; with this they make pastry, etc., and it is considered a luxury to have cakes of the farina of the Victoria Regia.

The next gatherer of this lily is M. D'Orbigny, who, in 1828, sent specimens to the Natural History Society of Paris, gathered in the Province of Corrientes, on a river tributary to the Rio de la Plata. "If," says M. D'Orbigny, "there exist in the animal kingdom creatures whose size, compared with our own, commands admiration, if we also gaze with wonder on the giants of the vegetable kingdom, we may well feel an especial pleasure in surveying any peculiarly remarkable species among those genera of plants which we had hitherto known of only moderate dimensions."

For eight months he had been investigating that Province, when, on descending the River Parana, and more than nine hundred miles from its junction with the Rio Platte, having in his company two Guarani Indians only, he observed that the marshes on either side the river were bordered with a green and floating surface; the Indians said it was a plant called "Yrupe, literally water-platter. Nearly a mile of water was overspread with huge, round, and

curiously-margined leaves, among which glittered, here and there, the magnificent white and pink flowers, scenting the air with their delicious fragrance." The flowers are over a foot across; are, on opening, white, and change to pink, or rose, or purple, with a perfume like the pine apple. The fruit is half as large, when ripe, as the human head, and full of roundish, farinaceous seeds.

Dr. POPPIG is the next traveller who met with it, during a residence in Chili, Peru, &c., from 1827 to 1832. While descending the Amazon River, he beheld some aquatic plants, whose almost fabulous dimensions entitled them to vie with the celebrated Rafflesia, of India, while they far excelled that marvellous production in beauty and inflorescence. He speaks of it as Euryale Amazonica. As the Victoria Regia has been proved perennial, and the Euryale annual, the name is unquestionably inappropriate.

After a period of five years, Sir R. H. SCHOMBURGK discovered this plant in British Guiana, and its introduction into cultivation in England, on the continent, and this country, is owing to his efforts. Not knowing of his predecessors' discoveries in other rivers, he addressed a letter to England, giving an account of its discovery. Five years later, in 1842, Sir Robert again detected the plant in Rupununi, an affluent of the Essequibo. "In my rambles through the West Indian Archipelago," he says, "I had frequently met the white water lily; but the remark of an eminent botanist, that these floating plants were entirely unknown on the continent of South America, did not make me expect to find a representative of that tribe, which, for the superior grandeur of its leaves, the beauty of its flowers, and its fragrance, may be classed amongst the grandest productions of the vegetable world. It was on the first day of January this year, while contending with the difficulties nature opposed in different forms to our progress up the River Berbice, in British Guiana, that we arrived at a point where the river expanded and formed a currentless basin. Some object on the southern extremity of this basin attracted my attention. It was impossible to form any idea what it could be, and, animating the crew to increase the rate of their paddling, shortly afterwards we were opposite the object which had raised my curiosity. A vegetable wonder! All calamities were forgotten. I felt as botanist, and felt myself rewarded. A gigantic leaf, from five to six feet in diameter, salver-shaped, with a broad rim of light green above, and a vivid crimson below, resting upon the water. Quite in character with the wonderful leaf was the luxuriant flower, consisting of many hundred petals, passing in alternate tints from pure white to rose and pink. The smooth water was covered with them, and I rowed from one to the other and observed always something new to admire. The leaf on its surface is of a bright green, in form almost orbiculate, with this exception opposite its axis, where it is slightly bent up. Its diameter measured from five to six feet; around the whole margin extended a rim about three to five inches high, on the inside light green, like the surface of the leaf; on the outside, like the leaf's lower part, of a bright crimson. The ribs are very prominent, almost an inch high, radiate from a common centre, and consist of eight principal ones, with a great many others branching off from them. These are crossed again by a raised membrane, or bands at right angles, which gives the whole the appearance of a spider's web, and are beset with prickles; the veins contain air-cells, like the petiole and flower stem. The divisions of the ribs and bands are visible on the upper surface of the leaf, by which it appears areolated. The young leaf is convolute, and expands but slowly; the prickly stem ascends with the young leaf till it has reached the surface; by the time it is developed, its own weight depresses the stem, and it floats now on the water. The stem of the flower is an inch thick near the calyx, and is studded with sharp elastic prickles, about three quarters of an inch in length. The calyx is four-leaved, each upwards of seven inches in length and three inches in breadth; at the base they are thick, white inside, reddish brown and prickly outside. The diameter of the calyx is twelve to twenty-three inches; on it rests the magnificent flower, which, when fully developed, covers completely the calyx with its hundred petals. When it first opens it is white, with pink in the middle, which spreads over the whole flower the more it advances in age, and it is generally found the next day of pink color. As if to enhance its beauty, it is sweet scented. The petals next to the leaves of the calyx are fleshy, and possess air-cells, which certainly must contribute to the buoyancy of the flower. The seeds of the many-celled fruit are numerous, and imbedded in a spongy substance. We met them hereafter frequently, and the higher we advanced the more gigantic they became. We measured a leaf which was six feet and five inches in diameter, its rim five and a half inches high, and the flower across, fifteen inches."

In 1845, Mr. BRIDGES discovered the Victoria in Bolivia. "On one occasion," he says, "I had the good fortune, while riding along the wooded banks of the Yacuma, a tributary of the Mamora, to arrive suddenly at a beautiful pond, or rather small lake, embosomed in the forest, when, to my delight and surprise, I descried, for the first time, the Queen of Aquatics, Victoria Regia! There were at least fifty flowers in view. They grow in four to six feet of water; each plant generally sends but four or five leaves to the surface, yet these cover the water in those parts where the plant abounds, touching one another so closely that I observed a beautiful aquatic bird walking with perfect ease from leaf to leaf."

Since 1845, it has been met with several times by travellers. Previous to that year, all who had met with this plant had come upon it unexpectedly.

In 1849, Mr. SPRUCE, a zealous naturalist, made a successful voyage up the Amazon in pursuit of it, and from Para, in November of that year, he sent flowers and leaves, preserved in spirits, to England. Having been told that a plant, answering to the description of the Victoria Regia, was growing in a lake on the largest island, at the junction of the rivers Amazon and Tapayoz, he planned an excursion in search of it. After arriving at the island, the ground was found covered with rank grass and rushes to the depth of six feet, and quite impassable. A little further down, in a small tide river communicating with the lake, which he was attempting to reach by this stream, was discovered the plant itself. Wading into the water, leaves and flowers were thus secured. The largest leaves measured little more than four feet across, but he was told they were much larger in winter, yet they were growing as close as they could lie, in about two feet of water. During the rainy season, the river would be much higher, the surface wider, and the plant doubtless would expand. Mr. Spruce says: "The aspect presented by the Victoria, in its native waters, is so novel and extraordinary that I am at a loss to what to liken it. The similitude is not a poetical one, but assuredly the impression the plant gave me, when viewed from the bank above, was that of a number of green tea-trays floating, with here and there a bouquet protruding between them; but, when more closely surveyed, the leaves excited the utmost admiration from their immensity and perfect symmetry. A leaf, turned up, suggests some strange fabric of cast iron, just taken from the furnace,—its ruddy color, and the enormous ribs with which it is strengthened increasing the similarity."

## NAMES OF THE AMERICAN WATER LILY.

EURYALE AMAZONICA (pronounced Eu-ry'-a-le, signifying a fury) was the name first given to this plant by Poppig, he thinking it identical with Euryale of the East Indies. Botanists have now no doubt that it is distinct in its characteristics.

VICTORIA REGINA, so called by an error of the press.

NYMPHÆA VICTORIA, so called by Schomburgk, he supposing it to be a Nymphæa, which it has proved not to be.

VICTORIA CRUZIANA. D'Orbigny.

VICTORIA REGIA has been proved by Dr. Lindley to be a distinct and well-marked genus; and notwithstanding Schomburgk (whose successful efforts caused this plant to be introduced into cultivation) named it Nymphæa Victoria, Dr. Lindley, who in 1837 printed a book descriptive and illustrative of the plant and flowers, proposed that Victoria be appended in the usual way of a distinct genus. He therefore gave the name Victoria Regia, and this is now the established and adopted one.

Schomburgk, in his British Guiana, says that he discovered this lily on the first day of January, 1837, one hundred and twenty miles from the coast. "An account of this having been sent to England, Dr. Lindley found it to be a new and well-marked genus, and gave it the name Victoria Regia."

## ITS CULTIVATION.

Sir R. H. Schomburgk, the discoverer of the plant in British Guiana, by his own exertions and aided by his friends there, made unsuccessful attempts to introduce living plants into England. The first seeds imported there, that germinated, were packed in moist earth in a bottle. This was in August, 1846. Two plants only survived till winter, when they perished.

On the 28th February, 1849, Dr. Hugh Rodie and Mr. Lachie, of George Town, Demerara, procured seeds, which they forwarded to Sir W. J. Hooker, in phials of pure water, agreeably to that gentleman's directions. By the 23d of March, seeds sown in earth, in pots immersed in water, and enclosed in a small glass case, with a tropical temperature, vegetated. These were distributed, and came to perfection first at Chatsworth, the seat of the Duke of Devonshire; next at Syon House, the Duke of Northumberland's; and subsequently at Kew. At the present time, plants have been successfully grown in several botanical gardens in Great Britain, and on the continent of Europe.

Sir Joseph Paxton prepared an account of the growth of the plant under his care, at Chatsworth, for a memoir of the Victoria Regia by Sir W. J. Hooker, and it is on this work we mainly rely for the correctness of our historical materials, a condensed account of which is here given for comparison with plants grown in the United States:—

"The Victoria Regia is, in my opinion, decidedly a perennial plant. After receiving our young plant from the Royal Gardens at Kew, on the third of August, 1849, it was placed in a pot full of water, and plunged in a bed heated to 85°, until the larger tank was ready for its reception, which was on the 10th of August. It was then turned out of the pot into a hillock of prepared soil in the centre of the tank, which, in the short space of seventy-nine days, it had completely filled, its dimensions being eighteen feet eight inches by nineteen feet one inch. Calculating by the size of the box it arrived in, which was thirteen inches square and afforded ample space for it, and the size of the tank filled, it must have added daily to its size the almost incredible number of six hundred and forty-seven square inches. This may be considered the most remarkable instance of the rapidity of vegetable development we have on record.

"Early in November, the leaves being four feet eight inches in diameter, and exhibiting every appearance of possessing great strength from the deep thick ribs, which form the foundation of the blade, I was desirous of ascertaining the weight which they would bear, and, accordingly, placed my youngest daughter, eight years of age, weighing forty-two pounds, upon one of the leaves; a copper lid, weighing fifteen pounds, being the readiest thing that presented itself, was placed upon it in order to equalize the pressure, making together fifty-seven pounds. This weight the leaf bore extremely well, as did several others upon which the experiment was tried, their diameter being four feet two inches to four feet nine inches.

"The plant continued to increase in size until the 11th of November, when it perfected its largest leaf, which was nearly five feet in diameter, with the edge turned up full two inches, showing the dark purple color of the under side of the leaf, and forming an agreeable contrast with the beautiful yellow-green of the upper. This edge the leaves preserve for about a month, and after that gradually become flat, and this edge is generally the first portion of the leaf to decay, unless the decay is occasioned by some internal constitutional disease, which generally occurs more or less in the dull months of autumn and winter. At those seasons the decay appears in spots on various parts of the surface. The young as well as the old leaves are liable to this disease, which should be immediately taken out with a sharp knife to prevent its spreading. The time, from the first appearance of the leaf to the perfect development, averages from nine to twelve days, and to their decay, six to eight weeks.

"From the 11th of November, the plant began to decline in growth, and its smallest leaf was formed on the 25th of December, which was two feet and half an inch in diameter. After this period, the plant began to show symptoms of reaction, and the leaves to increase in size, although very slowly, until the end of January. It had at that time twenty-four leaves upon it, and, with two or three exceptions, all were in a healthy state. This is the greatest number we have had at the same time on this plant. As it progressed, it gave us every reason to believe that the leaves would attain a much larger size this year (1850) than last, and, having the spring in its favor, it grew very luxuriantly, and fully realized our most sanguine expectations. Early in May we were desirous of ascertaining again what weight the leaves were capable of bearing. A leaf was accordingly removed from the plant for the purpose, floated in a brook which runs close to the Gardens, and a very light circular trellis of the same size was made and laid on the surface, so as to distribute the weight

equally. We then placed one hundred and twelve pounds upon the leaf, which it bore for some minutes before any water flowed upon it. It would have floated much longer were it not for the difficulty of equally distributing the pressure. The weights were then taken off, and a man, upwards of ten stone weight, stood upon it; this it bore for two or three minutes: after that, a person of eleven stone, which it bore for nearly the same time. This leaf was about five feet in diameter. Since that, we have had both ladies and gentlemen, from eight to eleven stone weight, trying the experiment, and the great buoyant power which they so evidently possess gives the individuals thus standing on them a feeling of perfect safety.

"About the middle of May, a leaf was cut, five feet two inches in diameter, and in July we had several, measuring five feet seven inches in diameter, their edges turning up more than three inches, perpendicularly, and of the most beautiful dark purple color. The flowers, at the same time, measured one foot one inch in diameter. The petioles of the large leaves measured nearly four inches in circumference, and the base of the peduncle three inches.

"About the beginning of August, the plant began again to decrease in size, although gradually; and on the 9th November, which was the anniversary of its first expanding its lovely flowers in this country, it had produced one hundred and fifty leaves, and one hundred and twenty-six flowers. With the exception of a few of the latter, which were removed in bud, with the view of strengthening the plant, it has never ceased flowering from the time of its commencement, and is now (Nov. 27) putting up its flowers with the same regularity as at the beginning, a property which we do not find any other cultivated plant to possess. The leaves are now three feet six inches in diameter, and gradually becoming smaller. The trunk, or root stalk, although it has been twice earthed up, is again out of the soil, and the rootlets, issuing from the base of the petioles, may be easily distinguished. I should say the trunk of our plant would be about five inches in diameter."

In a new house, constructed at a later period, a tank or artificial pond was made, of a circular form, thirty-four feet in diameter, with twenty-six cart-loads of prepared soil in the centre, at the bottom, for the roots to grow in. At a yet later period, tanks of more ample dimensions have been, or are being constructed, for the full development of the plant.

The plant at Kew, which was the last to blossom of the three before mentioned, was retarded by a deficiency in the supply of pure water. This difficulty being removed and an ample supply furnished, the plant, in the interval between 20th June and 15th November, produced sixty-five flowers.

Sir R. H. Schomburgk, from the first, considered the Victoria to be a perennial plant; other botanists, from its affinity to Euryale, thought it would prove an annual. From careful observations of Mr. Spruce with native specimens on the Amazon, and from specimens in cultivation in Europe and this country, the matter is fully decided, and no one now doubts its being perennial, like Nymphæa.

## DESCRIPTION OF THE PLANT.

For the botanical description of the Victoria Regia, I am indebted to the work of Sir W. J. Hooker, in part, and to the personal inspection of the plant by Rev. J. L. Russell, Professor of Botany to the Massachusetts Horticultural Society, and my own observation of the plant in Salem.

### ITS ROOT.

From the crown of a large spindle-shaped tuber, and on the appearance of each new leaf, a bundle of many fibrous feeders or rootlets proceeds, which often protrudes above the surface of the soil. These, when young, are of a yellowish, often of a reddish hue. The crown is also surmounted by a series of large scales, which are very apparent as the plant increases in size. There seems to be some intimate connection between these scales and the young leaf and the flower buds, the relative position of which will be referred to hereafter.

### LEAVES.

Their usual figure is nearly circular, the two alæ or wings almost grafted together at the edges, allowing however a narrow groove or channel, and separated only at the exterior of the leaf, somewhat in the form of a notch; a similar notch is seen on the side directly opposite, which is in fact the leaf's apex or summit. Some, on seeing this arrangement, have supposed that it was an intention to drain off the superfluous water which might lodge when the leaf was expanding, an explanation at least doubtful. When in the young stage of growth, and when unfolding, the leaf is exquisitely beautiful, equalling, in the estimation of many, the flowers themselves. When fully grown and mature, the texture of the leaf is thin and very tender; its color is of a pale green on the face or disk, but highly colored, and of a purplish crimson tint beneath. The edge or margin is turned up, to the width of from two to four inches, and when the sun shines upon this raised edge in the young leaves, a most beautifully varying crimson color is presented to the eye. Springing from the end of the petiole or leaf-stalk, where it joins the leaf, are eight main ribs, which diverge constantly into numerous lesser ones; and these diverging in all directions, strengthened also by arched or curved cross ribs or ties, afford the requisite firmness and support, and exhibit a truly wonderful mechanism. By simply placing a thin board upon the upper surface of the leaf, in such a manner as to equalize the pressure, a full grown man, of one hundred and fifty pounds weight, has been floated upon it; and in many instances, children of eighty pounds in weight have been thus sustained. I have been assured by gentlemen who have witnessed it, that the Indians, when collecting the seeds of this plant for food, place their infant children upon the leaves, previously throwing a goat skin upon their surfaces, which, while equalizing the pressure, affords also a dry and safe deposit. Each leaf grows upon its own petiole or stalk, which is penetrated with long and numerous cells, as are likewise the larger and lesser ribs, before mentioned. By this curious arrangement, the perfect buoyancy is maintained. Strong and sharp spines or prickles are thickly set upon the stalk, which extend also over the whole under surface of the leaf itself. Notwithstanding its gigantic size and elaborate structure, the texture of the leaf is so very delicate that should a straw fall perpendicularly from the height of five feet, so as to strike between the ribs, it would penetrate its substance. To render such a tissue, so eminently cellular and thus exceedingly tender and delicate, of a requisite consistence, what better or more wonderful arrangement could have been contrived?

The full grown leaf has been found to measure in winter time, usually, about four feet in diameter, and in midsummer, six or six and a half feet; this last size being the largest that it has been known to attain. During the intervening months, (that is, from August to the last of December,) the diameter gradually lessens in extent. From the last mentioned season onward to August, the leaves rapidly increase in size, the largest leaf being produced in the month of July. Many stories of their more extraordinary development may be set down as entirely unworthy of credit.

## THE BUD.

The flower-bud is of a large size, and when fully grown, just previous to its expanding, it measures from six to nine inches from the base to the tip of the sepals or calyx leaves. Its width or transverse diameter is from three and a half to four and a half inches. Each bud comes from the crown of the root or base of the plant, and at the surface of the soil, and is accompanied by a leaf-bud, which rises with it. I had imagined that they came out enclosed together, but I found that this is not the case. From repeated observation, I have perceived that the leaf issues from the central scale, which closes upon its opposite twin scale, after the leaf has risen a few inches; and there it remains, as before the appearance of the leaf. The flower-bud issues from the outside of this scale, between it and an outer one, and is furnished with a stem (peduncle) of similar character to that of the leaf (petiole), being armed with prickles even to the summit of the bud, the sepals or calyx leaves, even, being spiny. These sepals or calycine leaves are four in number. They are of a deep purple color, fading at the edges into a dull white, thick, coriaceous in their texture, and continuations of the thick, fleshy and prickly calyx tube, which partakes of the same color.

## FLOWER.

The flowers consist of from fifty to sixty petals in three distinct sets, each growing smaller towards the stamens. The outer petals are, on expansion, of a pure white color, and are from six to seven inches in length. Imagine a most delicate tissue of lace, with the interstices filled with some semi-transparent white substance, yet so soft and tender as to bruise under a slight pressure. This frail and almost gauze-like tissue is soon converted into a filmy paste, when the flower declines upon the surface of the water after it has finished its blossoming.

## BLOOMING.

The buds under my observation have been, as they approached the moment of bursting, gradually enlarging at the top, the calyx lobes loosening and separating from, yet leaving the petals firmly closed. At two, P. M., the peculiar pine-apple odor has filled the air of the house, and between the hours of four and five, the petals have expanded. Frequently one, immediately followed by others, would suddenly burst off, with a nervous spring, almost at right angles. By seven, the bud has assumed the appearance of a huge magnolia in form and color, but the numerous petals produced a more beautiful flower. All the flowers have been pure white at this, the first night of inflorescence, and they have remained so until the succeeding day has somewhat advanced, when the outer petals, following the lobes, would reflect, leaving a central portion, not yet expanded, erect, as seen in Plate No. 4. At this moment, tinges and rays or veins of pink can be discovered spreading up and over the white petals, which, before evening, become quite colored. In this change, however, the flowers differ, some being more highly colored than others. At meridian, this reflexed flower again closes, and remains as a partially opened bud till four in the afternoon, when it again expands, and at this time, the petals, that formed the upright or central portion of the reflexed form, spread out, presenting a beautiful crimson-marked petal upon a pure white; and here no two flowers can be said to exactly resemble each other, being variously marked. Sometimes the white ground appears as if the crimson had been accidentally rained in many different-sized drops upon them, with here and there a petal upon which the shower descended with such force as to color the whole. Again, a succeeding flower will be marked so exquisitely, in such nice lines, and with such well-defined limits, that you can scarcely realize you are looking upon the product of the same plant. Between the hours of six and seven, yet another change comes on; a third set of rigid, firmer, smaller petals rise up and stand in an erect position, yet curved somewhat, opening to view the centre with the golden-colored stamens, at this moment assuming the appearance of a coronet. These third petals have sometimes been of a pinkish salmon color, when first exposed to view; at other times, of a pinkish crimson;—when of the former, however, they have soon, by exposure to the light and air, become of the pinkish crimson.

In the coloring shown by the flowers in these last stages, we notice a difference on comparing them with the representations of those that have bloomed in England. I have never seen one with any yellow on the petal, or that had so much of the yellow tinge as is represented in the drawings illustrating the work of Sir W. J. Hooker, a crimson or pure white taking the place of the yellow, and producing a most brilliant flower.

At nine o'clock, P. M., the inflorescence is usually perfected, when the stamens and the interior or under side of the third set of petals assume the staminate yellow color. Soon after ten, the closing process commences, which slowly continues during the successive day, when the outer petals become of a dingy rose color, and the decaying remains sink under the water. A more full description of the blooming will be found in the accounts of the plants of Mr. Cope and others.

## STAMENS.

"In Nymphæaceous plants, the stamens are seen passing, by gradations, into petals; but in the Victoria, there is a clearly defined limit between the stamens and petals, best seen in Plate 4, where a circle of erect petaloid bodies encloses six or seven series of most decided stamens. All these, inserted upon the top or back of the torus, may be looked upon as the staminal crown. The stamens, composing the innermost rank of them, are sterile, thick, fleshy, lie densely packed nearly horizontally, yet in an ascending direction upon the back of appendages to the stigma, generally one to every two such appendages, and they seem slightly to cohere with them. The next four or five ranks which surround the innermost ones consist of perfect stamens; filaments broadly subulate, red, fleshy, but rigid, bearing the yellowish, linear, two-celled anther on its inner face, below the sharp apex; the cells separated by a narrow connective, and sunk in the substance of the filament. Around these is a rank or circle of petaloid stamens, yellow, tipped with red, and bearing

very imperfect anthers. The circle or crown first alluded to, surrounds these, and is quite petaloid, white, (soon stained with yellow,) streaked and spotted with rose color. The filaments of the stamens have air-cells as well as the petals. The pollen grains consist of three or four cohering cells, very pellucid, pale yellow, showing a limbus."

## PISTIL.

"Ovary, including the tube of the calyx, hemispherical, many-celled, with a very considerable depression at the top, formed by the sessile, concave, or deeply cup-shaped stigma, which has a conical, fleshy column in the centre, as in Nymphæa, and the surface is granulated, and furrowed by a great number of lines, (as many as there are cells to the ovary,) radiating from the centre to the circumference, crenated or toothed at the margin, constituting the stigmatic surface. Immediately at the edge or margin of this stigma is a closely-packed series of remarkable bodies. They seem at first sight to be a continuation of the rays of the stigma, consequently exactly equalling them in number, applied in part to the inner face of the annular torus, to which they slightly cohere, and in part to the inner base of the innermost sterile row of stamens which lie over them; they are closely packed laterally, compressed, curved or bent at an angle, broad below, tapering to a point above, but it is at the base that they are more firmly attached and less easily separated. Externally they have a thin, membranous integument, quite different from the firm texture of the stigmatic surface adjacent; the back is purplish brown, the sides pale. Internally they are yellowish, laxly cellular, spongy; in age, they appear filled with a loose mass of irregularly formed cells or granules, mixed with stellated filaments or spiculæ. A careful inspection of a section made vertically through these bodies and the torus and calyx-tube and germen will show, between the stigma and the calyx-tube, that a mass of the same spongy-like cellular matter is continued to the substance of the ovary, (surrounding the cells,) which is also of the same texture, but less colored. When the flower is past its best, these bodies may easily be separated from the torus, leaving, however, a distinct scar, also visible in the state of the fruit, and covered with the loose, pulpy, granular substance of the interior. In my early description of the Victoria Regia in the Botanical Magazine, I was erroneously led (on an examination of dead specimens) to suppose that these bodies were the stigmas. And more than one eminent botanist have considered Nymphæa as affording something analogous in the incurved points of its stigmas; but these are in reality a prolongation of the stigmatic rays; here, the texture is of a wholly different nature from that of the stigma. The very concave centre of the stigma is occupied by a pyramidical or conoid fleshy column, analogous to what is seen, though on a smaller scale, in the centre of the stigma of Nymphæa alba; a vertical section of this and of the adjacent base of the stigma, when viewed under the microscope, exhibits only very compact cellular structure, the latter having in addition several minute, brown, opaque bodies remote from the surface."

## SEED OR FRUIT.

"The fertilized ovary parts with its floral coverings, which decay, except the adherent calyx, and sinks under water to perfect its fruit and ripen its seeds; and again rising to the surface before the seeds are dispersed. The fruit is a very large berry, nearly globose, or rather urceolate-globose, for there is a constriction below the thickened margin, horrid with the copious persistent prickles, of an olive brown color.

"The thickened corrugated rim is nothing more than the shrivelled, persistent, annular torus, at the back of which may be observed the scars of the fallen or decayed sepals and petals, on the top those of the deciduous stamens; and in the inside of the rim we clearly discern the impressions left by the bodies which we described as crowning the margin of the stigma. The annular torus is incorporated with the whole of the cup-shaped stigma, and the two together form a large and curious operculum, which eventually separates from the fruit. Its shape is like that of a wash hand basin; it is coriaceous and leathery, beautifully fluted and ribbed within and without; it bears, on the lower edge of the rim, a portion of the adherent calyx, with a circle of spreading prickles. Although the falling away of the great operculum might lead to the idea that such was the mode of dehiscence of the fruit, yet that is not the case, for the pericarp bursts irregularly, soon decays, and the seeds are found scattered among the pulp. The seeds are greenish black, about the size of a pea, oval, with a slight projection at the upper end. The testa is hard, even on the surface; albumen copious, farinaceous, milky, and cellular when young; the embryo small, white, enclosed in a membranous sack, is lodged at the upper end of the albumen; the cotyledons are hemispherical, thick and fleshy; radicle short and superior."

A representation of the first growth of the seed is given, the testa still remaining visible on the surface of the soil under the water, with the first shoots and earliest leaves, of the natural size, as they appeared on the plant at Salem.

## CULTIVATION IN THE UNITED STATES.

The first flowering of this lily in the United States took place at Springbrook, near Philadelphia, the seat of Caleb Cope, Esq., 21st August, 1851. In a letter to Mr. A. J. Downing, Mr. Cope says: "I am sorry you were not here to witness the excitement which prevailed when the Victoria bloomed for the first time in this country, and when my grounds seemed to be in complete possession of the public. Since that event we have had a weekly contribution of a flower, the fourth one maturing last evening. I send you a report from my gardener, which will be interesting to those who wish to look into the detail of the culture and treatment of the plant. The committee on plants and flowers of the Horticultural Society were present on the second flower blooming. They measured the petals, which they found seven inches in length, and the crown or disk of the flower, three inches; thus making the diameter of the whole, seventeen inches. This is three inches larger than any flower produced in England. The leaves are also six inches larger than any grown there. The natural conditions of the plant in our country are, undoubtedly, more favorable than they can possibly be in England. There the water is at 85° generally, and the atmosphere at 75°; here it is just the reverse, which is, without doubt, more like its native country. I am satisfied that we have hit upon the right method of cultivating the plant, and that both flowers and leaves are equal to any found, either in a native or foreign state, in any part of the world. We have had no fire since the 21st of June. The flower, last evening, was more gorgeous than any of its predecessors. As its conversion was going on, in its

second stage, it seemed that the pink or red hue greatly preponderated over the white. I cut the flower, placed it on a thin circular board, a foot in diameter, which it completely covered, and sent it to a wedding party. The Victoria is one of the few things that has not been exaggerated. It is truly a wonderful plant."

By the diary of the growth of this plant we learn, that the seed "germinated on the 10th of April, 1851. On the 17th, the second leaf appeared, of a form similar to that of the Calla Ethiopica, being long and tapering, from a broad blade. On the 21st, a third leaf appeared, of like form. The 25th, the fourth leaf reached the surface, and was in the shape of an ellipsis, one end, however, being separated, till near the point where the petiole and leaf were united. May 3d, the fifth leaf appeared, which reached its maturity on the 6th; was nearly round, and measured 3 1-8 inches in diameter. The 9th, the sixth leaf appeared; it was quite round, and measured, at maturity, 3 7-8 inches. From the 16th of May to the 22d July, both inclusive, seventeen leaves appeared and matured. On the 27th July, the twenty-fourth leaf appeared: this leaf exhibited a beautiful salver edge, as have all its successsors; it measured 5 feet 8 1-2 inches in diameter. July 31st, the twenty-fifth leaf appeared, and measured at maturity 6 feet 4 inches. August 6th, the twenty-sixth leaf appeared, and measured at maturity 6 feet 4 1-2 inches. August 10th, the twenty-seventh leaf appeared, and measured 6 feet 6 inches: this leaf is six inches larger than any produced in England, of which we have any account. August 13th: this morning we discovered, to our great delight, a flower-bud rising a little in advance of the twenty-eighth leaf, which was also approaching the surface. August 15th, the twenty-eighth appeared. The 21st, the flower opened between five and six o'clock, P. M.: color, pure white; form, globular; very fragrant, odor strongly resembles highly cultivated pine apples. On the subsequent day, the flower remains in its primitive globular form, (with the exception of a slight variation,) until five or six o'clock in the evening, at which time it undergoes a complete transformation. So novel is the appearance of the transformed flower, that were we not conversant with its nature to 'metamorphose,' we could not believe it possible to be produced from the same plant. The petals become reflexed, lie prostrate on the water, and expose to view a disk so beautiful in color and form that I am sorry I cannot find language to describe it adequately. In its form it resembles a crown of some of the ancient kings of England, especially so when the flower has reached its climax. The disk, which first appears quite smooth and flat, becomes, in a very short time, perpendicular petalous-looking anthers, surrounded by others of crimson, embosomed in pure white. Thus it floats in its glory through the night, declines as the rays of light approach, the succeeding morn, and ultimately sinks into the element from whence it arose so noble and grand."

This plant was placed in the tank, in which it has since remained, on the 24th of May, 1851. Fire heat was continued by night to the 20th of June. During this period the thermometer averaged 85°. The preparation of the tank was, first, a covering of the bottom with charcoal and pieces of brick, to the depth of two or three inches, and half a dozen two-horse cart-loads of charred loam and leaf mould placed therein in the form of a mound. The temperature of the water, after artificial heat was dispensed with, varied materially, at times as low as 70°, and as high, again, as 83°. The glass of the house is frosted with lead ground in oil, to prevent injury from the too powerful rays of the sun. The house is kept nearly closed. Fresh water is admitted by day.

Mr. MEEHAN, the head gardener of Mr. Cope for the past two years, wrote the following account of the above plant for the Horticulturist of 1852. It can be found at page 205:—

TO THE EDITOR OF THE HORTICULTURIST:

Dear Sir—The interest which characterized the flowering of the Victoria in this country, continues unabated. The success which has crowned the efforts of Mr. Cope, and the abundant reward which the plant and its flowers afford its beholders, are inducing others to attempt its cultivation. It has occurred to me that a few notes on its progress here to the present time, would be interesting as well as seasonable.

It would not be extravagant to call the beauties of this plant unsurpassable. Like the gigantic idea its leaf-structure originated—the Crystal Palace—it stands among its class alone and unapproachable. Its flower has been compared to a colossal specimen of the night-blooming Cereus, (*Cereus grandiflora.*) In certain respects this comparison is just, as in the general appearance of the flower and its delightful fragrance; but when we proceed to examine each beauty separately, all comparison with any other flower must cease. It is not possible to select one property more than another, the which most to admire. It is everything to be wished for. A Victoria house is a perpetual conservatory, filled with ever-blooming flowers. Since its first flowering, in August last, this plant has produced, on an average, two flowers a week. Up to April first, there have been fifty-eight flowers on the same plant. Nor is this ever-blooming principle one long routine of wearisome monotony, for no two flowers can be said to be exactly alike. At the appearance of every bud there is something to anticipate—some new beauty, as yet unknown, to excite our curiosity, and raise up expectation. When they expand in the evening, they may be of any shade, varying from the purest white to the richest cream, till they close in the morning, as if to exhibit the change in their calyx from a greenish to a crimson hue. Soon after, the flower expands a second time, and exhibits the same flower quite metamorphosed—sometimes of the deepest pink—sometimes rich with crimson—and sometimes feathered with crimson and white, as if in playful mimicry of the delicate markings of a prize tulip. It is a strange flower—so grand, yet so accommodating! Promise a flower to a friend; he comes; the bud is only there. He is much disappointed. The occasion was an especial one—a marriage festival, perhaps, not perfect without the presidency of this queen of flowers. He shall at any rate have the bud. It is cut and placed in a box, with a little warm damp moss and a heated brick, and the top covered over. He reaches home, the box is opened, and a perfectly formed flower lies exposed to view! What can be more magical? Verily, nature, in the Victoria, throws the tricks of Monsieur Herbert, described in your last, far into the shade.

Nor does this ever-blooming, ever-changing property alone render it so admirable. The odor of its expanding buds is in itself a treasure. A whole house crowded with blooming Olea fragrans would not excel one bursting lily flower.

In a physiological point of view, the flower is no less interesting. Few plants better show the influence which light has on vegetation. When the plant here was in the most advantageous conditions in this respect, last fall, the leaves averaged about six feet in diameter. About six weeks ago they seemed to have declined to their minimum size, being then three feet eight inches. Now, as the light increases, the leaves exceed four feet. When there

is abundance of light, the leaves turn up at the edges; in winter they lose this peculiarity; they now seem to be resuming it. Our plant delights in a water temperature of 85°; below 80° or above 90°, an injurious effect is, at this season, perceptible.

Mr. Cope has kindly permitted me to state, that he will be happy to supply any one forming a tank for the Victoria with a plant for it; and I should be pleased to give any information to those desiring it, as well as to record any future observations in the pages of the Horticulturist.

*Holmesburgh, Pa., April 4th*, 1852.

THOMAS S. MEEHAN.

I had the pleasure of seeing this plant in October, 1852. It had then two buds on the surface of the water, and was in a healthy condition. In 1853, the last of September, I again visited it; the 137th flower had just closed, and was yet floating on the water, while the 138th bud could be seen just emerging from the scale of the leaves, showing every indication of health.

## TEMPERATURE AND SOILS SUITED TO ITS GROWTH.

From Baron Schomburgk's Views in Guiana, we learn that the mean temperature of the lily country is 81°.02 Fahrenheit; the maximum 90°, and the minimum 72°. The season in the interior is marked by two changes. From August to March, there are only occasional showers; but from March to August, there are heavy rains, when the rivers more or less overflow their banks. The following graphic account of the vegetation in the country, near which the lily was discovered, is from the above-named work:—

"Gigantic trees raise their lofty crowns to a height unknown in the European forests. Lianas cling to their trunks, spread over their branches to their summits, and fall again to the earth. The limbs and trunks of trees, the stones and rocks, and even the surface of the water is covered with a carpet of plants, with magnificent flowers. Nothing can give a better idea of the luxuriance of the vegetation than the splendid Victoria Regia, the most beautiful of the flora of the Western hemisphere, no doubt one of the most remarkable productions of the botanical world." This lily (says the same author) "covers, in conjunction with the azure-colored Pontedira, divers retricullariæ, a species of polygonum, Pistia, and numerous gramineæ, occasionally the whole surface of the river, so as to impede navigation."

The soils near the mouths of the rivers of this region are said to consist of rich, black, carbonaceous substances, of vegetable origin, often four or five feet deep. The mountain regions are composed of colored ochres, indurated clays, granite, gneiss, and trappan rocks, with a total absence of limestone, or its modifications.

In cultivating this plant it would unquestionably be wise to supply a soil like the above. That used by myself was chiefly sods, with all the soil that could be taken up with them. They were taken from a grass mowing field, the soil of which was a good yellow clay loam. After having been partially burnt and heated by fire, this soil was placed in a box, in the centre of the tank, and some perfectly decayed cow manure and leaf mould added, to a small extent, not more than one eighth of the whole. This answered the purpose well. Nothing was used at the bottom, like bricks or charcoal, to prevent the soils becoming too solid; neither can I perceive any necessity for such precaution in a water tank.

In its native country it is planted now in places near the sea coast. Four or five seeds are enclosed in a ball of soil or earth and cast into the water, and this simple method has succeeded well.

## THE PLANT IN SALEM.

The seed from which my plant was produced was presented me by CALEB COPE, Esq. It was ripened at Springbrook, the seat of this gentleman, near Philadelphia. It was sown in loam, overflowed with water to the depth of five or six inches, being merely covered with the soil. When the plant commenced its growth, which was on the 13th day of January, 1853, the seed appeared on the surface of the soil. The first shoot was like to a blade of the finest grass, and in eight days had lengthened three or four inches. January 22d, the second shoot appeared, grew to the length of six inches, was stouter than the first, and had an arrow-shaped termination. Jan. 29th, the third shoot came out. This was, at maturity, nearly nine inches long; in form, not unlike the small leaves of the Calla Ethiopica. February 5th, the fourth shoot appeared. This reached the surface of the water, and floated a leaf, measuring at maturity 4 inches in length by 1 7-8 in width. Feb. 11th, the fifth came out, and, at maturity, measured 4 3-4 by 2 3-4 inches. Feb. 18th, came the sixth, which, when matured, was 5 1-4 by 4 inches. From March 2d to May 30th, both inclusive, the plant put forth fourteen leaves, each successive one measuring from one to six inches more in diameter than its predecessor. The ninth leaf assumed the round form, and all after this have been nearly so. The salver edge appeared on the twenty-first leaf, and all those of after-growth were of that form, the edge measuring 2 to 3 1-2 inches in depth. This increase continued during June and the early part of July, the twenty-sixth and twenty-seventh leaves being the largest grown this season, and measuring, when fully expanded, 71 and 71 1-2 inches in diameter. On the 18th of July, the twenty-eighth leaf appeared, and this, with the succeeding ones, gradually lessened their dimensions as the days shortened.

The first flower-bud was seen on the third day of July, just emerging from the scale. It reached the surface on the 13th of July, six months after the seed vegetated. On the approach of night, the bud sunk under the water. On the 15th, a second bud was seen approaching the surface. The 21st, a third bud was visible, and the second reached the surface. This bud, pursuing the same course as the first, when evening approached, gradually settled down under the surface, to rise and stand erect again the following morning. At 4 P. M. of this day, the petals, a pure white, began to unfold, and from 5 to 6 they rapidly opened, showing the flower in its first form. It remained in this condition until after six, the next morning. Soon after 7 A. M. the flower began to change—the outer petals, expanding wide, showing the centre and yet erect ones tinged or spotted with crimson, at this moment measuring thirteen inches across. At 11 o'clock, these outer petals began to close, and at 12, meridian, all but the calyx lobes and one row of the petals had closed

loosely. From 4 to 6 P. M. the flower again opened, and exposed to view the inner and crimson petals. At 6.30, the staminate petals raised themselves, assuming an erect position, widening, however, by a slight curve at the extremities. At 7, the stamens had followed, and the bloom was completed. By 9 P. M. the interior or third set of petals and the stamens had become of a golden hue, and at this moment the flower was very beautiful. On the morning of the 23d, it was closed partially, and as the day advanced, this process continued, until it sunk under water.

July 24. The fourth bud discovered to-day. On the 28th, the second flower opened, and as my friend, the Rev. J. L. RUSSELL, has written a just and much more poetical description of the blooming than I can do, with his permission it is here used:—

"In the still and secluded bays of the Amazon and in the shallow waters of the forest lakes of tropical America, grows a vegetable wonder, the Victoria Regia, or Royal Water Lily of South America. The patience and skill of man has borne this magnificent plant from its native home, and transplanted it in the gardens of these northern regions. It has been lately my good fortune to have seen a specimen of this regal lily, and to 'consider how it grows.'

"In November, 1849, it first blossomed under cultivation in England; in 1851 it produced its flowers in Philadelphia; on the 21st July, 1853, it blossomed in Salem, and on Friday it showed another splendid flower in that city.

"First the bud presents itself, supported by a stout spiny stem, and lying on its side just above the surface of the water. As the sun rises and heats the atmosphere, it assumes a variety of positions, now standing almost perpendicular, now lifting itself gradually, and now lolling from side to side of the tank. As the luminary of day sinks in the west, the sensitive bud, as if regretting its departure, in its sorrow sinks beneath the water and is scarcely seen. On Thursday afternoon, at 4 o'clock, two of the outer flower leaves (calyx) sprung off with great force, and, in three fourths of an hour from this time, the regal beauty of the waters had displayed its first stage of glory! As each broad petal unfurled itself, it fell partly backwards, until three distinct rows formed a cup of rare elegance and of apparently the whitest purity. The still air of the greenhouse was now filled with its rich perfume, as if it were some conscious Beneficence silently blessing all in its august presence. This chaste cup of ivory-like color was set off by the yet unfolded interior flower leaves (petals), betraying a few streaks of carmine tints, whose splendor was yet to be revealed.

"As the still shades of evening stole over us, the proud queen of the waters remained in an unchanging serene beauty, and awaited another day. For nearly twenty-four hours, it was much the same, the expanded petals changing their positions somewhat, and partially closing at meridian; but about 4.30 P. M. on Friday last, nature resumed her office in the panorama of this vegetable marvel.

"The first evidence of the unfolding was the somewhat sudden springing apart of the interior petals. As they opened, so each change showed something new and gorgeous. Here, on one portion, was the flower leaves (petals), no longer of ivory whiteness, but tinted with delicate rose; on another part were streaks and dashes and spots of rich carmine; and on others were pencil markings of the same color, and of a feathery outline; on others still, the crimson color was intense, and some petals were of that entire color, except at the very base, where a clear white obtained.

"Thus the regal lily had assumed her robe of state, and was attired in a drapery of Tyrian splendor, 'such as Solomon in all his glory could never boast.' Nor was this all. The proud attire of the queenly plant was not yet assumed. The plastic hands of the servitors of nature were yet to mould the royal diadem and crown their lovely monarch. The interior of the flower appeared like a large button carved out of delicate rose-colored carnelian, with its centre depressed. In a few minutes the eye could perceive a change. The depression rose visibly to the surface, and presently it became of a conical form. The rosy and narrow petals also, swelling at their curved portions, gradually became erect, and the points of each petal, standing close side by side, made an empalement of a circular outline. As this rapidly appeared, the interest of the spectators was at its height. In a few minutes the entire spectacle was to be completed. At last, the golden anthers were visible, and the triple coronal circle of their narrow laminæ stood up around the precious disk of the flower, to minister to its future destiny and to complete its work. The stately beauty of such a spectacle could scarcely be comprehended at this moment of its fulfilment. It fills my mind even now, and appears more exceedingly strange and fearfully pleasant as distance and time lend their enchantment to the scene."

A bud and leaf continued to appear, and a flower to expand, on every sixth or seventh day through August. The last of this month and the early part of September, the temperature of the house and of the water was kept very low, to harden the plant, if possible. As an enlarged house was found desirable in order that the tank might be of more ample dimensions, circumstances required the entire removal of the house containing the lily. Unfortunately, the weather became very cold soon after the removal, and the mercury fell on several nights as low as 42° to 50°, Fahrenheit. Fires were kept under the boiler at night, and every precaution taken to shelter the plant by covering the tank with boards and carpets. The temperature of the water decreased from day to day, and when the glass was put upon the house, the 16th day of September, it was 67°. The effect produced upon the plant was more apparent on the flowers and buds than upon the leaves, checking the growth of both, but more effectually that of the buds.

The sixth and seventh flowers continued in bloom three and four days in consequence of this. They did not open wide, but perfected the bloom, assuming and retaining the cup shape, the form of the first stage. The seed vessels were more or less injured by this low temperature, and the older leaves became spotted with decaying portions, and this was all the injury that could be discovered. On several occasions I have noticed that there was apparently a discharge of a thick, muddy or gummy substance from the under side of the leaves. By this the edges of the tank have been stained, and white substances placed in the water have been colored a purplish red. A free flow of pure water through the tank would remove this. It will be proper here to mention that I depended upon rain for a supply of fresh water, and that this colored discharge took place when there was a deficiency in the supply.

The account by Mr. Cope of the flowering of his, the first Victoria Regia grown in this country, together with a diary of its progress from the seed to its blooming by his gardener, may be found in the Horticulturist, Vol. VI, page 460, a condensed account of which we have copied, page 11. It will be noticed on comparison that the first flower-bud flollowed the twenty-seventh leaf and with the twenty-eighth in both plants. The salver or upturned edge to the leaf appeared at an earlier period of growth on my plant, which I attribute to growing it at a lower temperature of the water. My plant vegetated at midwinter, and as no artificial heat was applied to the water after the first of June, its progress may be considered as satisfactory.

To grow the plant under the most favorable circumstances, the temperature of the house should be not less than 70° at night, and 80° to 90° by day, when the sun shines; that of the water being not under 74°, nor higher than 85°, Fahrenheit.

Here, in conclusion of the account of the culture of the lily in Salem, it will be proper to state that I have aimed to grow the plant during our summer without aid from fire heat; relying simply upon the protection of a glass covering for a suitable climate. This was all that was required in June, July and August. The last of August we had changeable, and some very cold weather. On several mornings the temperature within the house was 62°, Fahrenheit; that of the water, 68° to 70°. This cool weather was succeeded by great heat, and the plant did not appear to be injured. By these trials, and the result of them, I am led to the conclusion that the plant will survive and be healthy under this temperature, provided the weather be clear. A higher temperature is decidedly to be preferred, effecting more rapid growth of leaf and flower, consequently affording a greater number of blooms, under the most favorable circumstances being capable of producing a flower every third or fourth day; and with this low temperature requiring double that time, which delay is still more increased as the sun withdraws to the south.

The delay consequent upon preparing further illustration than originally intended, has postponed the completion of this treatise. This has been increased by the earliest seeds sown remaining eight months in the tank before vegetating. Additional drawings of the young plant being deemed essential as confirmation of the correctness of previous ones.

The past winter of 1853 and '54 proved very cloudy, stormy, and severely cold; on several nights the mercury falling to 17° below zero of Fahrenheit. The temperature of the water in the tank, with that of the air of the lily house, was kept at an average of 75°. Had it not been for the unusual cloudy weather, I have good reasons for supposing that the plant would have survived. After October, when continuous cloudy and stormy weather prevailed, it would suffer severely; reviving and giving hopes of its recovery on the re-appearance of sunshine. An excessive fall of snow, attended with great cold and high wind, on the last days of December, and repeated early in January, so covered up the house with ice and snow as effectually to shut out the light and warmth of the sun for a week or more. Continued cloudy weather during January completed its destruction, having survived rather over one year, and continuing to send up flower buds to the last. Possibly it may have been weakened by the low temperature consequent upon the erection of the house, and by the non-agitation of the water,—the covering over the tank rendering it impossible to work the water wheel during this time.

Seeds were again furnished me by Mr. Cope, but they did not grow. More were procured by Professor A. Gray, of Harvard University, from Sir Wm. J. Hooker, Director of the Royal Gardens at Kew, near London, and planted in March. The 11th of May, one of these commenced growing. On the 5th day of June, the third shoot from a seed planted last October, obtained from Mr. Cope, was discovered coming to the surface of the water from a depth of five feet. These plants advanced rapidly. Should no accident happen to them, they may be expected to blossom in September. The original plant of Mr. Cope's, now on its fourth summer, remains in health, and has borne over 200 flowers.

It does not appear to be an easy or simple matter to bring a Victoria Regia to maturity. I have sown many seeds, in every possible position under cultivation, and only a very few of them have vegetated. Many individuals, in various sections of the Union, have unsuccessfully made the attempt. Others, having succeeded in raising plants, have lost them after one or at most a few blooms. Even Mr. Cope, whose success has been so great, failed in his first attempts, having as early as 1850, through the hands of Thos. P. James, Esq., Secretary of the Pennsylvania Horticultural Society, received seeds from Sir Wm. J. Hooker. The late Mr. Downing furnished him with a further supply. The plants raised from these were killed by too much heat. A second parcel from Sir William, furnished the plant yet alive,—the source whence all have emanated in this country, with the single exception of my plant now growing from the seed furnished Professor Gray.

The ill success in preserving the plants alive and in health on the approach of and during the winter, causes some yet to think the plant an annual. It suffers in cloudy weather from the want of its native tropical sun. The proper action of the leaves is interfered with; black spots appear and spread rapidly upon them, only checked by the reappearance of sunshine. When assured my plant was dead, which was when it ceased to send forth buds or leaves, it was uncovered so as to see the condition of the roots. There was found a tuber or a Rhizoma of a beet red color, partially decomposed; with a countless number of rootlets, some yet alive, others dead, and a mass of decomposed matter below all. During its decline, every method that could be thought of to preserve it was tried, and a correspondence with Mr. Meehan, the head gardener at Mr. Cope's at that time, was maintained, in the hope that his experience might be the means of suggesting some change in its management which would result favorably; notwithstanding, we were disappointed in this hope. Extracts from these letters, as they throw light upon its proper treatment, and confirm the statements of gentlemen who have examined the growth of the plant in its native waters, are here given. Mr. Meehan differs in one thing only; he has never found the Rhizoma or tuber, and does not think the plant has this. The examination of my plant establishes the fact, and confirms Mr. Spruce's examinations upon plants found on tributaries of the Amazon, if any confirmation was necessary. This is readily accounted for by the fact of the quick decay of every part of the plant. Had the examination of the Salem plant been delayed one week, it is probable nothing but rootlets would have been found, as this had softened on the outer surface. Mr. Meehan says, during the winter of 1851-52—"The leaves of our Victoria became spotted and died away, as yours have done; sometimes an entire leaf would turn black in one night. Supposing the cause to be an escape of gas from the flue, this, with Mr. Cope's consent, was removed, and the hot water pipes alone relied upon for affording heat. After this, the plant did not suffer so much as before; still sometimes the black spots would appear. In the spring, nearly all the water was drained out, and a few inches of new soil put in; and for some months none of these spots appeared. Towards the fall, air bubbles from the soil became numerous, especially near the middle, where the plant grew; and I noticed that when any bubble came up under a leaf it soon produced the black spot. On trying common air it did not cause that effect. An oily substance floated on the surface where the bubbles burst. A few inches of sandy loam, with three cart-loads of sandy washings from the turnpike, was put in the tank over the soil. This had the desired effect; there were no more spots or bubbles, and the plant increased in health and beauty. Thus far all was well; but the young plants kept going back, and some of them died. I decided to turn them out and examine the structure of the roots more closely than I had ever done. This afforded me a valuable lesson.

I learned how the Victoria might be sometimes an annual and sometimes a perennial, and I doubt now, although it has been flowering and growing more than three years in this tank, whether it is entitled to take rank with perennials as we usually understand them. Not a single root or even cell alive now, will be alive after the decay of the present living leaves. There appears no living stem. The roots push from the base of the leaf-stalks. They do not put forth till the leaf begins to unfold above the water. If the leaf becomes injured the roots push feebly; if much hurt they do not push at all. When a leaf dies, or is cut off, the roots in connection with it die, and so does what may be called the stem, with which it is connected. Thus the plant is constantly raising itself higher in the soil, and allowing the easy escape of injurious gases from its decomposition. This discovery suggested several things:—first, the necessity of preserving with the greatest care every particle of the leaves in the greatest health possible; and secondly, to add frequently a layer of fresh soil for the new roots to push in, and to prevent gaseous exhalations. These, with a temperature not below 65° or 70°, will enable the Victoria to live for any number of years in the same spot."

That Mr. Meehan did not find a Rhizoma or tuber in the young plants, may be explained by the fact that time and age must be requisite before this can be formed. Mr. Spruce, whose examinations of the plant were made on tributaries of the Amazon, had plants of full growth in abundance before him. There, this Rhizoma or tuber was found, and its habit of decaying below and forming upwards established. The appearance of new rootlets at the base of the stem (petiole) of the new leaves, with the decay of the old ones, on the death of the attendant leaves, was stated by him, as confirmed by the examination of Mr. Meehan.

## DESCRIPTION OF THE PLATES.

FRONTISPIECE. This is an illustration of the first two cycles of the growth of the lily; at the twelfth page the diary of this can be found.

The left hand drawing represents the plant when the first cycle of five leaves is completed, every successive leaf being larger than its predecessor. The right hand figure exhibits the plant when the second cycle is completed.

This is the mode of its growth; a continued repetition of the cycle of five leaves, with a steady advance in their size until the maximum one, which usually is the twenty-seventh or twenty-eighth, is produced, when, if the plant is in health, the last-named leaf is accompanied by the flower-bud. After the plant has commenced flowering the first year, the successive leaves do not enlarge, but remain of the same size, or diminish gradually as the sun withdraws to the south; increasing again as it returns to the north in the spring. These leaves do not grow regularly from left to right, but they follow what is called the five-ranked arrangement. What this is can be seen by the drawings; every successive leaf in the growing plants being larger than the previous one. On the right hand figure the smallest leaf is the sixth which the plant made, and this grew directly over the first, or simple spear, like a shoot of grass. On the third cycle, the eleventh leaf appeared over the sixth, and every leaf throughout is true in its growth to this arrangement.

When a plant is in deep water this cannot be ascertained. In two plants grown in shallow water, and afterwards placed in deeper, we have been able to notice this. On a third, where the seed was sown at a depth of five feet, nothing of its growth was observable before the fourth shoot; the first leaf which floated upon the surface came up. Under ordinary circumstances the three first shoots do not come to the surface; if the seed should vegetate in only two or three inches of water, probably they would. Upon the plant sown in deep water, the first leaf which floated extended its stem six or eight feet to bring it to the surface, whereas on those in shallow water, they attained but a small portion of that length, thus indicating with what ease it adapts itself to its position. A matured plant will grow the petiole upwards of fifteen feet, if sufficient room is provided.

The bud which should produce the eleventh leaf is not represented in the drawing; coming as it does directly over the first and sixth shoots, it would have interfered with the proper showing of the latter. This leaf-bud is folded up closely, when it first appears on the surface side, presenting a slight induration. This folding may be explained thus;—close the hands by placing the fingers upon the palms of each, separately, let the thumbs fall naturally upon the fingers, bring the closed hands together, the wrists touching firmly and the fingers loosely; the slight opening between the fingers of each hand may be considered as corresponding to the lines of the ribs, wanting the cross lines; this suture between the hands representing the induration at the centre, where the unfolding of the leaf has begun. By extending the thumbs upwards somewhat, and closing the hands firmly at the wrists at the same time, slowly opening the fingers upwards, outwards and downwards, the process of unfolding can be seen. The outside of the bud constitutes the under and ribbed side of the leaf, as shown in plate third.

The second plate is a representation of portions of the leaves of a matured plant, with the expanding flower of the actual size, as described on the twelfth page. An opening or unfolding leaf, with a leaf-bud just emerging above the water, with the accompanying flower-buds, is a partial view of the plant as mentioned at the ninth and thirteenth pages. The largest leaf measuring 71 to 72 inches in diameter, with eight leaves of different sizes. The small size of the tank rendering it necessary to remove the older ones to make room for those expanding. In its native waters five leaves is named as the maximum number found upon a plant, and it does not appear that more than ten can be maintained in health under cultivation in the latitude of Boston.

The third plate is a drawing of the underside of the leaf. It will be remembered that the shape is nearly round. This is in perspective, that the wonderful mechanism may be the better shown.

The fourth plate shows the flowers during the intermediate stages, as mentioned at pages nine and thirteen. But they continue in these forms a short time only. Advantage has been taken here to show the curious sporting habit in the various markings of the crimson. These, with the full blown flower, as shown in plate fifth, being correct illustrations of the earliest flowers, as mentioned on the ninth page, and also in Mr. Meehan's communication on the eleventh page.

Plate fifth is the full blown flower, or just completing the bloom, as the stamens have yet to unfold somewhat in the centre.

The bud nearest the flower is represented as it appears usually the day before unfolding, rather more advanced than it would be seen at this time. A fruit is also shown here, having risen to the surface after perfecting its seed. To make the illustrations as complete and varied as possible, without adding too much to the cost by a multiplication of the plates, has been the governing motive in their arrangement.

Plate sixth is a view of the form of the flower mentioned at the thirteenth page, being that of the sixth and seventh which expanded on the plant at Salem. The cause of this sport cannot be determined, earlier and later flowers expanding fully.

## CONCLUSION.

The expense, the great care requisite, with the extreme difficulty of growing the Victoria Regia in a climate so rigid and unsuitable as this, of the Northern States of America, will render the cultivation of this plant very rare.

The heat and moist atmosphere of the lily house, caused by so large a body of tepid water, renders a long continuance in the house unpleasant, and, to an invalid, an unwarranted exposure. By the aid of this treatise and the accompanying illustrations, one may fully appreciate its beauty and wonderful growth. In the agreeable temperature of his parlor he may contemplate the changes of leaf, bud, and flower; to witness which, in its native or artificial waters, days of exposure to a tropical climate must be endured.

It is always advisable, when convenient, to obtain a view of the living plant; but many cannot do this; to such, it is hoped, these descriptions and illustrations may afford instruction and gratification.

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## NOTE.

With reference to the coloring of the young leaves (which are the largest) of frontispiece plate, as well as of that of the leaf bud just expanding on the plate of opening flower, some explanation seems necessary, that this may be rightly understood. When the leaf bud comes to the surface of the water, it is of a pale yellow color. If the day be bright and clear, it soon changes to a dull red; the second day, the sun shining bright, this red changes to a light or crimson hue. So rapid are these changes that on the third morning the bud will be found unfolding and of this brilliant coloring, with the green appearing only in the centre of the leaf. By evening the crimson has changed to the green, tinges of it only remaining on the lines that mark the ribs and on the suture. These changes and the brilliancy of the coloring are dependent upon the action of the sun's rays, varying greatly as this is hindered by clouds or other obstructions. To illustrate all these changes would require so great an additional number of plates as to render the work so expensive as to be of little value for general observation. Looking upon the plant the following day, only green leaves or the surface of them would be seen, (the edges on the under side being always colored,) and any one naturally would suppose the crimson coloring an exaggeration. I have seen both the leaves and the leaf bud when the coloring has been more brilliant than represented. They vary in the manner of change; the green usually appears first in the centre and spreads out, but sometimes it appears on the outer edge of the young leaves at the same time as on the centre, thus forming a crimson ring; a few hours will change the whole to green.

## ERRATUM.

Page ninth, sixth line from bottom, read, for "best seen in Plate 4," "best seen in Plates 4 and 5."


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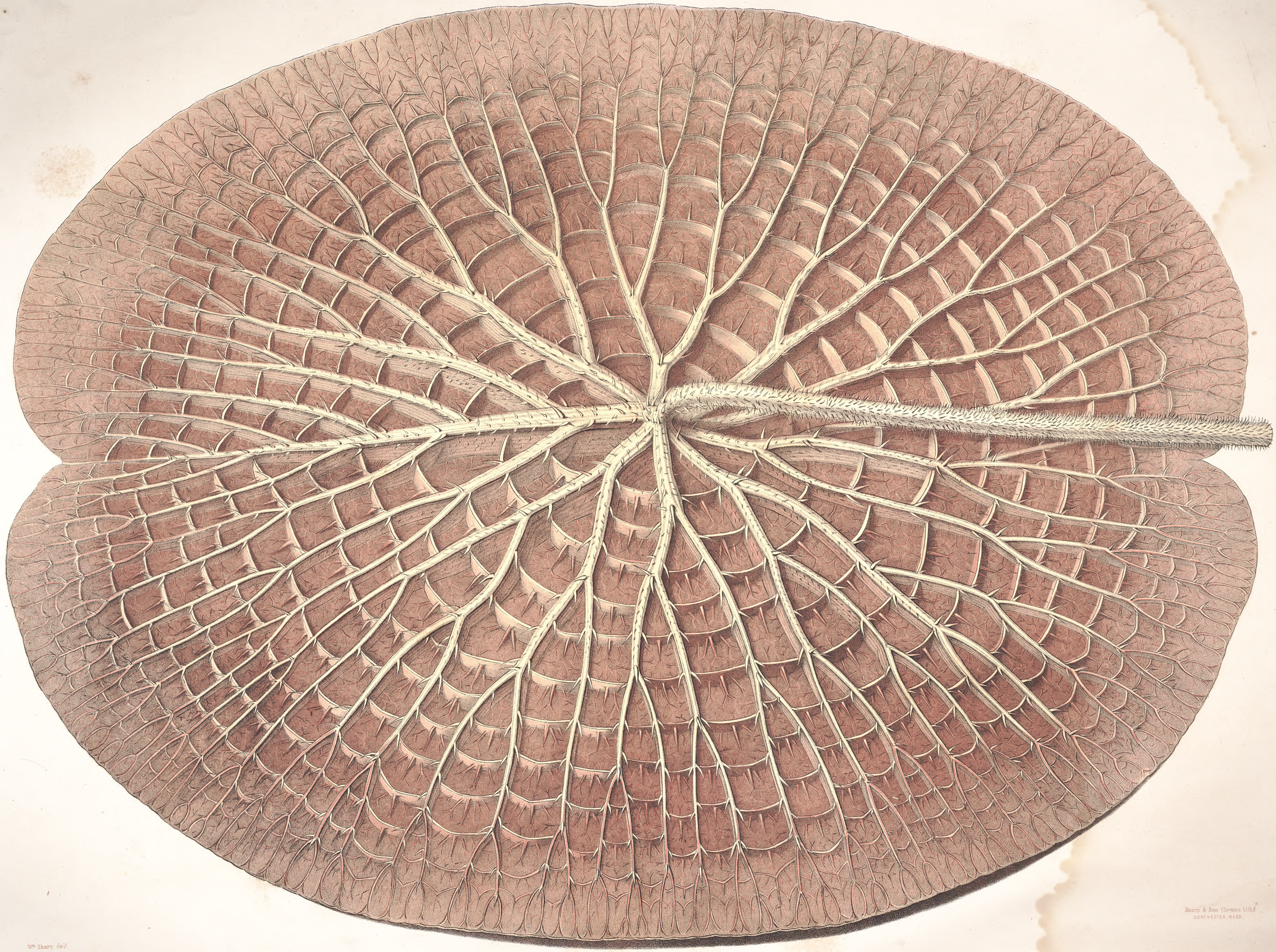

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